

Women Professionals in Construction Industry: Barriers and Approaches to Improve Wellbeing, Safety and Health

Vimlesh Prabhu Desai¹ and Lysette D'souza²

¹Sr. Associate Professor, School of Business, National Institute of Construction Management and Research, H. No. 7-06, Jagganguda (V), Shamirpet (M), Aliabad, Hyderabad, Telangana 500101, India, E-mail: vimlesh.prabhudesai@gmail.com (corresponding author).

²Assistant Professor, V. M. Salgaocar Institute of International Hospitality Education, Raia, 403720. Goa. India, E-mail: lyseth_d@yahoo.co.in

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Abstract: The construction industry's male-dominated image, working ethos, and environment have led to an abysmal representation of women professionals in the workforce. The industry, the second largest employer in India, contributing 9% to India's GDP has a mere 2% representation of women professionals (architects, site engineers, quantity surveyors, planning engineers, safety professionals, etc.) in employment. Manpower shortage continues to challenge the industry and poses an opportunity for women and employers alike. In this context, the paper aims to identify and evaluate the barriers and approaches to improve the wellbeing, safety, and health of women professionals at project sites thus increasing their share in employment. A mixed approach of questionnaire survey, interviews, and focused discussion was adopted. The top three barriers identified were – Long working hours and a culture that working long demonstrate work commitment, Remote and changing work locations of project sites impacting family life, and Inflexible work hours; while the top three approaches were – Providing appropriate sanitary facilities, Separate and clean restrooms and Evaluating performance based on output rather than hours put in. Results suggest that men and women shared a common perception of all barriers and approaches except for three. The findings will aid in advocating for women's wellbeing, safety and health at construction sites and spread the word about the value of gender mainstreaming.

Keywords: Barriers, Construction, Health, India, Safety, Strategies, Wellbeing, Women

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1. Introduction

India employs 57mn people in the construction industry but only 7mn (12%) people are females. In technical, managerial, and leadership roles such as site engineers, architects, planners, quantity surveyors, contract administrators, supervisors, etc. the figure is around 2%. Of these, only 2% reach top management/board level in the construction industry. The situation is similar across the world, be it a developing or developed country. In the USA, 11% of the construction workforce are females, while at the executive level, this figure stands at 7% (US Bureau of Labor Statistics, 2022). In the UK, 12% of those employed at construction project sites are women, while at the executive level, the figure stands at 15% (Seidu et al., 2022). As of 2018, 14% of construction workers in China were female (WSJ, 2021). Women are numerically and hierarchically underrepresented in the construction industry, as is evident from the preceding statements. Efforts to improve gender diversity at construction project sites are gaining momentum. The inclusion of women is important as gender diversity increases productivity (Sahoo and Lenka, 2016), and improves the efficiency and work environment of the industry (Norberg and Johansson, 2021). Moreover, diversity in the workforce enriches decision-making and helps to get a holistic view e.g. in real estate how spaces are used and need to be designed.

Like other countries, India is facing a huge shortage of educated and skilled professionals (engineers, architects, quantity surveyors, contract administrators, etc.) at construction project sites. One of the possible solutions to address this is to reduce gender inequality and attract women professionals. Increased female participation is necessary to fill the gap (Norberg and Johansson, 2021). Male-dominated image, occupational health hazards, lack of safety, insecure work environment, work-life balance, etc. make it less attractive for women professionals to join the industry. Naoum et al. (2020) noticed that in the UK women's self-perception is affected by their professional paths, which are more zigzag than men's. In today's competitive era, firms face challenges in attracting and retaining women talent in the construction

industry (Kumar and Chaturvedi, 2018). Thus, it becomes imperative to understand the barriers and strategies to improve the percentage of women professionals in the construction industry. The study aims to answer two research questions - 1) what 'barriers' impede the participation of women professionals at construction project sites? And 2) what 'approaches / strategies' will improve the wellbeing, safety, and health of women professionals at construction project sites?

2. Literature review

Despite all the efforts and initiatives taken by organisations and governments, the industry has not been able to attract enough women professionals (Norberg and Johansson, 2021). Women professionals encounter various challenges / barriers that impact their well-being, health and safety at construction project sites.

Women working in construction industry can be placed in three different categories based on type of work;

1. Technical such as engineers, architects, quantity surveyors, supervisors etc.
2. Secretarial and administrative such as normal office administrative work
3. Unskilled, semiskilled and skilled labour workforce involved in construction trades at project sites

This study focuses on women in the first category.

2.1. Barriers

The male-dominant image and the notion of toughness and roughness play a crucial role in determining hierarchy in the construction industry (Norberg and Johansson, 2021). The macho culture has been protected by men with aggression and hostility towards non-standard co-workers. This inhibits women from being part of the team. Denissen's (2010) study of male colleagues protecting female co-workers from physically difficult work demonstrated that they do not belong to the construction sector, confirming their macho identity. Over-protectiveness by male colleagues at project sites makes female professionals feel vulnerable by highlighting their physical inabilities. There is an increased risk of discrimination and harassment for women in non-traditional occupations such as construction (NYCOSH, 2014). In a survey carried in the UK in 2019, 72% of females experienced some form of gender discrimination at construction project sites (Benady, 2022). Women in construction experience gender discrimination during career advancement and for senior leadership roles; besides, the lack of female role models acts as a barrier to promotion (CCIWA, 2019).

Complex tasks, tight deadlines, harsh work environment, and multifaceted work relationships make project-based construction activities stressful. There is a perception that the job is hard, dusty, and unclean. Even benefits and welfare measures have been hindered due to the tolerance of harsh working conditions by the males. According to Gale (1994), unlike in other industries, women in the construction industry are regarded as inferior to their male counterparts. Hence, women have to often prove they are capable of performing duties in adverse and tough circumstances. Long hours, heavy workloads, a wide variety of workplace risks, musculoskeletal disorders, conflict, aggression, and subpar working conditions are all part of the construction industry's package (Rouhanizadeh and Kermanshachi, 2021; Namian et al., 2020; Rani et al., 2018; Menches and Abraham, 2007). Bowen et al. (2008) found that women quantity surveyors in South Africa consider the industry is male dominated, especially when it comes to views on maternity leave and flexible work hours. Even in today's modern age, women feel less comfortable and face many safety-related challenges in workplace (Khan, 2022).

The health-related challenges appear to be a major obstacle to gender diversity in the construction industry (Mariam et al., 2021). Women often experience increased stress and exhaustion because of their multiple roles at work and at home. Work-related stress is increasingly viewed as occupational safety and health (OSH) issue. Liang et al. (2020) observed that working in the construction industry can be harmful to the health and safety of female employees. Women appear to be more vulnerable than men to developing job-related health problems (Tapia et al., 2020). Women professionals in the construction industry face increased levels of stress due to higher gender discrimination (Sunindijo and Kamardeen, 2017). Those stressed due to discrimination don't perform well; moreover, if they are exposed to physically challenging tasks they are more likely to be injured frequently and thus be less productive. The presence of hazardous substances (Regis et al., 2019), harsh working conditions like standing for long periods of time, excessive climbing, etc. can be harmful to women's reproductive system.

2.2. Strategies

In the field of construction, women are an underutilized resource both in professional and skilled construction trades roles (Oo et al., 2022). To gain acceptance from male colleagues, English and Hay (2015) found that women need to change to fit in. Dainty et al. (2000) noted that women may either behave like men or lower their aspirations and take secondary roles in the male-dominated construction business. Women professionals would thrive in an atmosphere that encourages and celebrates differences among its members. A welcoming environment gives everyone a place and ensures a fair shot at succeeding. For diversity to become a reality, the male fraternity must be more receptive towards accepting women in the construction industry. Promoting an inclusive culture within construction project sites may be accomplished via actions such as targeted recruitment drives, diversity training, and mentoring programmes (Vohra et al., 2015). Ghanbaripour et al. (2023) found that women professionals benefit from specialised training programmes that address their particular needs and difficulties faced at construction project sites. Providing clean, hygienic, and exclusive washrooms and appropriate sanitary facilities at project sites contributes to the well-being of women (Griffin, 2013). Changing work practices in the construction business has benefits for health and welfare, as demonstrated by a 5-day work week study in New South Wales

(Lingard and Turner, 2022). South African quantity surveyors were motivated by decision-making opportunity, creative work, and recognition, according to Bowen et al. (2008).

Having a clear promotion path and senior management female role models can certainly improve the count of women professionals (Benady, 2022). Seeing females in leadership positions improves the morale of women professionals and makes it simpler for them to be acknowledged and welcomed. The more the females are seen performing and succeeding in the construction industry the more likely it is that they will be accepted. Ginige et al. (2007) suggest enhancing the image of the construction industry to attract women, improve diversity, and fill the skill gap.

3. Research Methodology

The study consisted of four stages – stage 1 was a systematic literature review (SLR) of previous works which laid the foundation for stage 2 - the pilot study. Stage 3 was a questionnaire survey administered among construction industry professionals. Stage 4 – focused discussion with a select group of experienced professionals.

SLR helps to provide a comprehensive overview of the literature and identify gaps. There are limited studies carried in the area of women in construction; this is validated by Ghanbaripour et al. (2023) research where they found that though women’s participation is stubbornly low in the Australian construction industry only a limited empirical construction management literature is found on women in construction. Analysis performed on identified literature set a good groundwork to understand the construction industry scenario, the gender diversity across countries and helped to identify barriers/challenges and strategies to improve the well-being, safety, and health of women professionals at project sites.

After SLR, a pilot study was performed. The pilot study consisted of a draft questionnaire and semi-structured interview with five female and three male professionals from the construction industry. Each of these professionals had a total construction experience of a minimum of 10 years and construction project site experience of a minimum of five years. The purpose of the pilot study was to,

- ensure the questions are relevant and appropriate to the study
- assess the factors and delete irrelevant ones, modify factors to get appropriate meaning, and add any important or missed ones relevant to the Indian context
- verify unambiguous phrases that may alter answers
- assess the capacity of respondents to comprehend the meaning of the questions asked
- assess data collection

The output of the pilot study was a final questionnaire with a total of 20 barriers and 17 strategies to improve the well-being, safety, and health of women professionals at project sites. Refer Table 1 for the barriers and strategies.

Table 1. Barriers and strategies to improve wellbeing, safety and health of women professionals at project sites

Code	Barriers / Challenges	Source	Code	Strategies	Source
B1	Negative perception of women’s capabilities	Ghanbaripour et al. (2023)	S1	Separate and clean restrooms	Griffin (2013)
B2	Male resentment (anger/ bitterness /dislike etc.) against women	Dainty et al. (2000)	S2	Providing appropriate sanitary facilities	Oo et al. (2022)
B3	Sexual harassment	Regis et al. (2019)	S3	Elevating women to top management	Benady (2022)
B4	Gender discrimination	Norberg and Johansson (2021)	S4	Top management support to have women professionals at project sites	Pilot study
B5	Dirty glances, insecure and unsafe work environment	Regis et al. (2019); Sunindijo and Kamardeen (2017)	S5	Eliminating gender discrimination and sexism	Norberg and Johansson (2021)
B6	Extreme weather and tough terrain of project sites needing sheer strength and a high level of tolerance	Venugopal et al. (2016)	S6	Flexible work hours	Lingard and Turner (2022)
B7	Aggressive, abusive, and disrespectful language from construction workers	Pilot study	S7	Evaluating performance based on output rather than hours put in	Lingard and Turner (2022)

Table 1. Barriers and strategies to improve wellbeing, safety and health of women professionals at project sites (continued)

Code	Barriers / Challenges	Source	Code	Strategies	Source
B8	Common and unkept restrooms	Perrenoud et al. (2020)	S8	Improving women's image in projects by giving them a voice in decision making	Ferguson (2022); Bowen et al. (2008)
B9	Reproductive health issues brought on by the nature of the job and use of hazardous products	Regis et al. (2019)	S9	Offering challenging, unbiased, and equal opportunities	Perrenoud et al. (2020)
B10	Lack of acceptance as a supervisor by construction workers, contractors, and other service partners	Pilot study	S10	Menstrual leave/period policy	Price (2021)
B11	Inappropriate sanitary facilities during the menstrual cycle	Perrenoud et al. (2020); Venugopal et al. (2016)	S11	Training and career development programs tailored for women	Benady (2022)
B12	Society's perception of the construction sector as being dominated by men	Ghanbaripour et al. (2023); Menches (2007)	S12	Ensure a secure and safe work environment	Khan (2022)
B13	Remote and changing work locations of project sites impact family life.	Styhre (2011)	S13	Enhancing the image of the construction industry for Women professionals	Ginige et al. (2007); Pilot study
B14	Long working hours and a culture that working long demonstrates work commitment	Ghanbaripour et al. (2023); Clarke et al. (2017)	S14	Involving more than one woman in a group to reduce feelings of isolation	Sugerman et al. (1999)
B15	Women's accomplishments and achievements not appreciated	Bowen et al. (2008)	S15	Rewarding and compensating women on similar lines as their male counterparts.	Bowen et al. (2008)
B16	Inflexible work hours	Perrenoud et al. (2020)	S16	Sensitize male co-workers to value women as equal partners in the workplace	Vohra et al. (2015)
B17	Lack of women role models in the construction industry	Hickey and Cui (2020); CCIWA (2019)	S17	Educating women about dangers to the reproductive system from hazardous substances and activities	Regis et al. (2019)
B18	Lack of mentorship	CCIWA (2019)			
B19	Crude workplace language due to male dominance e.g. dirty jokes, swearing and sexist humour	Adinyira et al. (2020)			
B20	Slow career progression, lesser preference during appraisal period due to biased approach towards male counterparts	CCIWA (2019); Dainty and Lingard (2006)			

A questionnaire survey was administered among construction industry professionals; both male and female professionals (engineers, architects, planners, safety officers, quantity surveyors, contract administrators, etc.) with

experience of working on construction project sites were encouraged to participate. The authors encashed their network, contacts and over 20 years of industry experience to approach professionals with relevant experience to partake in the questionnaire survey. They were personally reached out to explain the purpose of the study and seek their concurrence to contribute.

In addition to filling demographic and organizational details, the respondents were asked to rate the barriers and strategies on a four-point Likert scale (0–strongly disagree and 3–strongly agree). To avoid the propensity of people choosing the "safe" neutral view prevalent in odd number Likert scales like 5- or 7-point scales, a 4-point scale is chosen (Chyung et al., 2017). An even-numbered Likert scale, often known as a forced Likert scale, encourages responders to choose a side rather than remain neutral (Chyung et al., 2017). 4-point Likert scale has been used in construction industry research – Sichali and Banda (2017) used 4-point Likert scale to measure green building awareness in Zambian construction industry, Gituro and Mwawasi (2017) used it to measure factors influencing road construction time and cost overruns in Kenya while Dawood and Sikka (2006) used it to measure the performance of visual 4D planning in UK construction industry.

Participants had to indicate to what degree they agreed a specific item is a barrier/ strategy. A score of zero indicates ‘strongly disagree’ (non-significant), whilst a score of three indicates ‘strongly agree’ that an item has an influence as a barrier or strategy (0 – ‘strongly disagree’, 1- ‘somewhat agree’, 2- ‘agree’, 3- ‘strongly agree’).

4. Data Analysis

The analysis of data obtained from the questionnaire survey was carried out using IBM SPSS software. Despite all the efforts taken, the response rate of the questionnaire survey was 22.05%. This is good considering the profile of the respondents and the demanding work pressure leading to disinterest in research activities. The respondents represented reputed national and international firms such as DLF, L&T, Tata Projects, Jacobs and E&Y, KPMG, WSP respectively. They had varied designations such as Director, Partner, Consultant, Assistant Vice President, Dy. General Manager. Out of 195 questionnaires distributed, 43 valid responses were received (6 responses were not considered as they were not appropriate); the proportion of male and female respondents was nearly half. Pamidimukkala and Kermanshachi (2023) interviewed 22 female professionals from Texas, USA to identify and rank challenges and strategies faced by female workers in the construction field and office. Tunji-Olayeni et al. (2018) used 50 valid questionnaires from female construction professionals against 93 distributed to study work-life conflict among women in the construction industry in Lagos, Nigeria. Against 105 questionnaires circulated, Dabke et al. (2008) received 38 valid responses in their study to determine if demographic variables affect the satisfaction level of women in construction trades in Cincinnati, USA.

The data collected was analyzed using IBM SPSS software. A brief about respondents’ profile is given in Table 2 below.

Table 2. Details of the respondents

Respondents information	Groups	Number	Percent
Gender	Male	21	49.00%
	Female	22	51.00%
Highest level of education	Graduate	5	11.63%
	Post graduate	36	83.72%
	Doctorate (PhD)	2	4.65%
Basic Qualification	Engineer	32	74.42%
	Architect	8	18.60%
	Planner	3	6.98%
Total industry experience (years)	> 15	4	9.30%
	>10 & ≤15	4	9.30%
	>5 & ≤10	19	44.20%
	>2 & ≤5	10	23.25%
	≤ 2	6	13.95%
Experience on construction project sites (years)	> 10	4	9.30%
	>7 & ≤10	5	11.63%
	>5 & ≤7	4	9.30%
	>3 & ≤5	15	34.89%
	>1 & ≤3	6	13.95%
	≤1	9	20.93%

88% of respondents had post-graduation and higher levels of education, 62% of the respondents had more than 5 years of total industry experience, and 64% of respondents had more than 3 years of construction site experience.

4.1. Reliability Test

To determine the internal consistency of the factors used in the questionnaire, the data was subjected to a reliability analysis test. The widely used reliability test is Cronbach’s Alpha. Data is considered reliable and good for further analysis if the value of Cronbach’s Alpha coefficient is above 0.70. For the present study, Cronbach’s alpha coefficient was 0.948.

4.2. Mann-Whitney Test

Non-parametric test is used to compare the responses of groups when the data violates the normality assumptions. For the present study, the Mann-Whitney non-parametric test of variance was used to observe differences in the responses of the ranked data between two groups – male and female professionals. The test was carried out to examine whether the agreement on the barriers and strategies was perceived similarly or differently by the two groups. The result of the test is shown in Table 3 and Table 4. The result indicated that both groups perceived most of the barriers and strategies similarly except for B3- Sexual Harassment, B15- Women's accomplishments and achievements not appreciated, and S14- Involving more than one woman in a group to reduce feelings of isolation.

4.3. Relative Importance Index

The ranking of barriers and strategies was determined using the Relative Importance Index (RII). Refer Table 3 and Table 4. RII has been widely used to rank factors, Hansen et al. (2020) used RII to rank factors motivating women to work in the Indonesian construction industry, as shown in Eq. (1).

$$RII \text{ (Relative Importance Index)} = \frac{\sum W}{(N \times A)} \tag{1}$$

W – Ratings given by respondents to each factor on a scale of ‘0 to 3’. A - The highest rank on the scale which in this case is ‘3’, and N - number of total respondents

Table 3. RII ranking of barriers and Mann-Whitney U Test

Code	Barriers						Independent-Samples Mann-Whitney U Test	
	Overall		Female		Male		Sig.	Decision (Retain / Reject null hypothesis)
	RII Overall	Rank	RII Female	Rank	RII Male	Rank		
B1	0.481	11	0.476	10	0.485	7	.910	Retain
B2	0.364	17	0.413	12	0.318	11	.326	Retain
B3	0.395	14	0.286	16	0.500	6	.050	Reject
B4	0.519	9	0.508	8	0.530	5	.851	Retain
B5	0.543	7	0.492	9	0.591	4	.363	Retain
B6	0.434	13	0.365	14	0.500	6	.226	Retain
B7	0.380	15	0.333	15	0.424	8	.368	Retain
B8	0.550	6	0.571	6	0.530	5	.733	Retain
B9	0.372	16	0.397	13	0.348	10	.858	Retain
B10	0.481	11	0.476	10	0.485	7	.990	Retain
B11	0.605	4	0.619	3	0.591	4	.7883	Retain
B12	0.574	5	0.667	1	0.485	7	.075	Retain
B13	0.651	2	0.571	6	0.727	1	.167	Retain
B14	0.667	1	0.635	2	0.697	2	.616	Retain
B15	0.341	18	0.444	11	0.242	12	.029	Reject
B16	0.636	3	0.603	4	0.667	3	.525	Retain
B17	0.535	8	0.587	5	0.485	7	.414	Retain
B18	0.450	12	0.524	7	0.379	9	.203	Retain
B19	0.496	10	0.508	8	0.485	7	.870	Retain
B20	0.450	12	0.524	7	0.379	9	.218	Retain

At .05 significance level, asymptotic significances are displayed.

Table 4. RII ranking of strategies and Mann-Whitney U Test

Strategies	Independent-Samples Mann-Whitney U Test
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Code	Overall		Female		Male		Sig.	Decision (Retain / Reject null hypothesis)
	RII	Rank	RII	Rank	RII	Rank		
	Overall		Female		Male			
S1	0.868	2	0.841	3	0.894	2	.226	Retain
S2	0.876	1	0.825	4	0.924	1	.079	Retain
S3	0.729	12	0.762	7	0.697	11	.434	Retain
S4	0.783	8	0.794	5	0.773	8	.799	Retain
S5	0.783	8	0.730	9	0.833	5	.335	Retain
S6	0.729	12	0.746	8	0.712	10	.762	Retain
S7	0.853	3	0.857	2	0.848	4	.865	Retain
S8	0.822	5	0.873	1	0.773	8	.142	Retain
S9	0.798	7	0.841	3	0.758	9	.174	Retain
S10	0.752	11	0.667	11	0.833	5	.189	Retain
S11	0.760	10	0.730	9	0.788	7	.565	Retain
S12	0.837	4	0.794	5	0.879	3	.341	Retain
S13	0.798	7	0.778	6	0.818	6	.754	Retain
S14	0.705	13	0.587	12	0.818	6	.043	Reject
S15	0.814	6	0.794	5	0.833	5	.671	Retain
S16	0.775	9	0.714	10	0.833	5	.260	Retain
S17	0.760	10	0.746	8	0.773	8	.771	Retain

At .05 significance level, asymptotic significances are displayed.

5. Discussion

The authors conducted focus group discussion with two academicians and three industry professionals to extract major themes from barriers and strategies. The participants had a minimum of five and ten years of site and total construction industry experience respectively. Ghanbaripour et al. (2023) used focus group meeting for the same purpose in the context of women in the Australian construction industry. Salleh and Phui (2014) used focused group discussion to ascertain barriers and strategies for the application of Building Information Modelling. Focus group discussion involves engaging in an in-depth discussion on a particular topic with a small number of people in an informal manner. The themes that were extracted from the focus group discussion are deliberated below.

5.1. Barriers

a. Gendered culture and male resentment- This theme consists of

- Negative perception of women’s capabilities
- Male resentment (anger/bitterness/dislike etc.) against women
- Sexual harassment
- Gender discrimination
- Dirty glances, insecure, and unsafe work environment
- Lack of acceptance as a supervisor by construction workers, contractors, and other service partners

Rosa et al. (2017) identified, work-life balance and negative perception towards women as major challenges in women’s career growth in the Australian construction industry. The male dominance and chauvinism promulgates gender bias, discrimination, and unfair treatment of female counterparts. The cultural clichés of the construction sector have been widely chronicled, emphasizing its highly competitive and indisputably male-dominated characteristics (Paap, 2006). Watts (2007) argues that construction sites are hierarchical and rife with sexual harassment. According to a few respondents, dirty glances, lewd remarks and other forms of sexual harassment pose a significant challenge for accepting an assignment at construction project sites. Male resentment towards women has kept females away from leadership roles. Women’s representation in leadership roles creates a cultural dilemma in the construction industry. Sexual misbehaviour and gender inequality lead to psychological distress. Construction sites have a potentially disaffected and unruly male construction workforce that resists being managed (Druker and White, 1996). A male respondent commented, “...acceptance of a female professional as a supervisor or manager by workers is a big-big barrier. My workers had a big time problem in obeying instructions given by women”. He further stated that Top management should stand up for women supervisors and support their leadership even if it amounts to delay in work.

b. Tough work environment- This theme consists of

- Extreme weather and tough terrain of project sites need sheer strength and a high level of tolerance

- Remote locations of project site impacting family life
- Long working hours
- Inflexible work hours

Long and inflexible work hours act as leading barriers for women professionals at construction project sites (Watts, 2009). Ghanbaripour et al. (2023) observed it as the foremost reason for women to leave the construction industry in Australia. Remote and changing work locations of project sites along with inflexible work hours take a toll on family life. Collinson and Collinson (2004) argue that women managers can succeed only if they put work and career before family and home, just like their male counterparts. Since the industry is male-dominated, what the males perceive becomes the norm of the industry such as rigid and extensive work hours, aggressive behaviour, etc. The lack of adequate compensation in relation to the significant pressure and stress levels inherent in construction management positions, employers' expectations of constant availability due to the prevailing culture in the industry, the challenge of balancing managerial responsibilities with family duties leading to negative perceptions and scrutiny, and the organizational belief that hard work equates extended working hours, makes work-life tough for females (Watts, 2009). Accidents and injuries are a major issue at construction sites (Ghasemi et al., 2018) and hence the industry is labeled as one of the riskiest industries (Xu et al., 2018).

c. Aggressive and crude workplace culture- This theme consists of

- Aggressive, abusive, and disrespectful language from construction workers
- Crude workplace language due to male dominance e.g. dirty jokes, swearing, and sexist humour

People from different backgrounds, temperaments, ages, physical abilities, cultures, religions, educational backgrounds, castes and levels of experience work on construction project sites. The site subculture, with its crude language, pornographic office displays, and resistance to management, seemed to cause the most problems (Watts, 2007). Women, like any other marginalized groups, are often the target of sexualized jokes (Watts, 2009). Kanter (1993) noticed that overt rather than covert sexual jokes and crude language may be used when a woman joins a male-dominated workplace to make the newcomer feel as different and outside as possible. Because of the physically demanding nature of work many of the construction workers are accused of being influenced by alcohol. This could increase the likelihood of aggressive, abusive, and disrespectful language, dirty jokes, swearing, and sexist humour at sites. Adinyira et al. (2020) noticed that aggressive behaviour such as yelling, pushing or shoving, hitting, oral abuse, intimidating with a finger, and bullying are common at construction sites. Such an environment may render the job sites unsecure for women professionals to work. Female professionals get emotionally drained due to varying degrees of confrontation they encounter, intense monitoring (as a result of increased visibility), sexual harassment, intimidation, and safety issues (Watts, 2009).

d. Unhealthy workplace and lack of career prospects- This theme consists of

- Reproductive health issues brought on by the nature of the job and use of hazardous products
- Inappropriate sanitary facilities during the menstrual cycle
- Common and unkept restrooms
- Society's perception of the construction sector as being dominated by men
- Lack of women role models in the construction industry
- Lack of mentorship
- Slow career progression, lesser preference during appraisal period due to biased approach towards male counterparts
- Women's accomplishments and achievements not appreciated

Common and unkept restrooms, inappropriate sanitary facilities, and reproductive health concerns due to the hazardous nature of work make construction site assignments unhealthy for women. Slow career progression, lack of recognition from superiors, lack of women role models to look up to, and absence of mentorship inhibit women's career growth in the construction industry. Watts (2009) argues that the prevalent masculinist attitude of the construction industry favours males, elevates certain men above others, and marginalizes women managers. Women can only succeed if they conceal their femininity in order to cultivate a more socially acceptable presence and conform to 'male' expectations, but in doing so they walk a fine line between acceptance and opposition (Watts, 2009). Women have to go above and beyond to prove their capabilities which possibly leads to frustration and hampers their growth. Women professionals assume a lack of dedication in the absence of fairness and equal chances. Some female respondents commented that being a woman, their skill sets are undermined. Female professionals' heightened visibility in male-dominated industry creates significant pressure on them to perform well (Cohn, 2000).

5.2. Strategies

a. Healthy, secure, and safe work environment- This theme consists of

- Separate and clean restrooms
- Providing appropriate sanitary facilities

- Eliminating gender discrimination and sexism
- Menstrual leave/period policy
- Ensure a secure and safe work environment
- Educating women about dangers to the reproductive system from hazardous substances and activities
- Sensitize male co-workers to value women as equal partners in the workplace

Separate and clean washrooms and appropriate sanitary facilities deliver a hygienic and secure workplace and help overcome many of the health and safety challenges that are faced by females (Pamidimukkala, 2023). Gender discrimination and sexism are pronounced in the construction industry. Sensitizing male co-workers to value women as equal partners in the workplace will encourage a congenial work environment and weed out gender discrimination. Gender equality increases innovation and productivity resulting from different perspectives and ideas. Organizations should educate women to safeguard possible harm to the reproductive system from hazardous materials, emotional stress, and strenuous work conditions. One of the male respondents commented "...we should enforce better standards of safety measures, use superior personal protective equipment (PPE), follow international norms which in turn can elevate health and safety culture and allow safe working of people irrespective of gender". A female respondent felt that ladies should not shy away from complaining about sexual harassment, unhygienic restrooms, and inappropriate sanitary facilities.

b. Managerial roles and flexible work hours- This theme consists of

- Elevating women to higher levels of management
- Top management support to have women professionals at project sites
- Flexible work hours / Job sharing

Elevating females to leadership roles in the construction industry will motivate the women diaspora. Besides, women derive emotional support and encouragement from female role models (Pamidimukkala, 2023). Top management should inspire women professionals at construction sites in letter and spirit. This will encourage them to explore assignments at construction project sites. Some of the respondents stated that though firms engage women at construction sites the superiors display bleak backing at the time of promotion. Hence, to even this out committed and systematic approach to women's career advancement should be observed. A female architect with over 10 years of industry experience felt that ladies should be equally buoyant and aggressive about their career progression as male counterparts. Adaptability, which demands cultural shift in the way industry functions such as mutually advantageous shift patterns, job sharing, and flexible scheduling, will make the sector more inviting to female employees with families. Flexible work hours will help women to perform their dual roles at the office and at home more comfortably. Women can give quality time to their families, health, and upbringing of their children while at the same time being devoted to work.

c. Recognizing and acknowledging women's contribution- This theme consists of

- Evaluating performance based on output rather than hours put in
- Improving women's image in projects by giving them a voice in decision making
- Offering challenging, unbiased and equal opportunities
- Rewarding and compensating women on similar lines as their male counterparts

Involving women professionals in decision-making tasks at project sites will enhance their image in the eyes of their male counterparts and construction workers. Offering challenging, unbiased, and equal opportunities will provide a platform for women professionals to showcase their mettle. Male chauvinism influencing performance evaluation based on the number of hours put in rather than the output delivered needs to be scrapped. Women professionals' contributions should be regarded and treated on similar lines as their male colleagues. Women are more likely to exhibit higher levels of job retention if they are provided with equal opportunities as their male counterparts within a company (Pamidimukkala, 2023). A female respondent commented, "...lady professionals need to be assertive and believe in their capabilities and stand up to their male counterparts with confidence and vigour." A fair recruitment system, and exposure to captivating tasks on mega projects in addition to routine tasks will encourage females to take advantage of available opportunities.

d. Women-centric career programs- This theme consists of

- Training and career development programs tailored for women
- Enhancing the image of the construction industry for women professionals
- Involving more than one woman in a group to reduce feelings of isolation

Industry-academia outreach programs targeting female students during the early days of their professional education will get them familiarised with various disciplines, fields, and career prospects available in the construction industry. This approach will effectively promote interest and develop the active involvement of women in the industry. Any doubts with respect to safety, work environment, harsh nature of work, pre-conceived male dominance, etc. can be cleared at these programs. At the individual firm level, programs and policies tailor-made to advance women's careers will help attract and retain female employees. Besides, the construction industry's manpower deficiency problem can be solved if women are

provided with equal employment opportunities and benefits as men (Safapour and Kermanshachi, 2020). Similarly, enhancing the image of the industry and moving away from male bastions would make them embrace the construction industry as a probable career option. Firms can reduce loneliness experienced by female employees at construction project sites by having more females in a group / at sites. This will also act as a source to guide them against inappropriate behaviour at the workplace.

6. Conclusion

This study aimed to ascertain the barriers and approaches to improve the wellbeing, safety, and health of women professionals at construction project sites. Stereotypical views of femininity lead to construction industry opinions of women as unfit. Sexual harassment and gender discrimination is a common theme when women discuss their workplaces; exclusion and actual words of discrimination show that gendered and sexualized interactions persist in the construction industry despite laws and regulations (Norberg and Johansson, 2021). Paap (2006) noticed that remoteness from company headquarters makes it simpler to flout official policies and thus women at project sites could be more susceptible to sexual harassment than those at headquarters. Since this study pertains to women professionals at project sites, the above observation is noteworthy. Although there are opportunities for women professionals and few have even achieved high levels of echelons of success in the construction industry, the sector is often seen as a sexualized workplace where masculine norms prevail. This is due in large part to the widespread belief that women lack the "natural" skills necessary to succeed in the field. The construction sector needs to make gender a priority if it is going to attract women. Female involvement has to be made visible and problematized among all employees. Gender equality is not a women-only problem that can be solved by hiring more women on the assumption that doing so will transform workplace culture and even civilise males. Hearn and Piekari (2005) found that having women in organisational leadership does not necessarily develop gender equality. The fallout of the study is that the policymakers should design effective initiatives to attract women professionals, support their development, educate male bastion to accept the change, and thus improve gender diversity. With the study's findings in hand, construction industry decision-makers will have a better grasp of the obstacles women face and the approaches to be adopted to create welcoming workplaces where female employees can excel and flourish professionally.

The authors identified 20 barriers and 17 strategies after a thorough literature review and pilot study. Using quantitative and qualitative approaches and statistical tools the barriers and strategies were ranked and differences in perception between women and men professionals were found out. The focused group discussion helped to categorize the barriers and strategies into some major themes. The top three barriers identified were – Long working hours and a culture that working long demonstrate work commitment, Remote and changing work locations of project sites impacting family life, and Inflexible work hours; while the top three strategies were – Providing appropriate sanitary facilities, Separate and clean restrooms and Evaluating performance based on output rather than hours put in. Results suggest that men and women shared a common perception of all barriers and strategies except for two barriers- Sexual Harassment, Women's accomplishments and achievements not appreciated, and one strategy- Involving more than one woman in a group to reduce feelings of isolation. The results will help in campaigning for women's well-being, health, and safety at construction sites and educating others about the importance of gender mainstreaming.

The study pertained to women professionals in the Indian context hence its output may not be generalized to other countries, cultures, etc. Further studies can focus on how women are perceived in other sectors. The respondents were degree holders; women in construction trades or women labour workforce may have a different set of challenges.

Author Contributions

Vimlesh contributed to conceptualization, methodology, validation, draft preparation, manuscript editing, visualization, supervision, and project administration. Lysette contributed to conceptualization, methodology, data collection, manuscript editing, and visualization. The authors have read and agreed with the manuscript before its submission and publication

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Dr. Vimlesh Prabhu Desai is a Sr. Associate Professor at the National Institute of Construction Management and Research, Hyderabad, Telangana, India. He is a management expert and strategist having 27+ years of corporate and academic experience. His expertise lies in business strategy, business development, business process re-engineering, new business initiatives, public-private partnerships etc. He is an SAP certified consultant in SCM (Supply Chain Management). Vimesh is a member of EPPM Association; membership no. 608.



Dr. Lysette Margaret D'souza is an Assistant Professor at V M Salgaocar Institute of International Hospitality Education, Goa, India. She is a management graduate with over 20 years of experience across Academics and Corporate. She has vast and rich experience in the areas of marketing management, organizational behaviour, international business, and financial management. She also holds a Thomas Profiling certification. Her research focuses on experiential marketing, strategic management, and sustainability.